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THE IMPLICATIONS OF GLOBALIZATION FOR FIRMS`DEMAND FOR SKILLED AND UNSKILLED LABOR

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The Implications of Globalization for Firms' Demand for Skilled and Unskilled Labor[1]

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Abstract

This paper investigates the impact of globalization, in the sense of increasing international trade, on the demand for skills in Danish manufacturing companies. The study is based on a unique data set that enables us to develop rich measures of international outsourcing and import penetration. Moreover, the data also allows several strategies to strengthen the causal interpretation of our results. The main finding of the analysis is that it is of crucial importance to distinguish imports - both in the form of outsourcing and overall imports - by country-of-origin. We find that international trade with low-wage countries leads to skill-*upgrading*. This is especially pronounced for import penetration with a ceteris paribus contribution of around fifty percent to skill-upgrading. Moreover, we find that import penetration in goods originating from high-wage countries lead to skill-*downgrading*. This latter result suggests that Danish manufacturing has comparative advantage in skill-intensive production when compared to low-wage countries, but in unskill-intensive production when compared to high-wage countries.

Keywords: Skill-upgrading, Low-wage country outsourcing, Low-wage country import penetration, Comparative advantage

JEL: F14, J24; L60

1 Introduction

This paper investigates the implications of globalization - in the form of increasing international trade - for the demand for skilled and unskilled labor in Danish manufacturing companies, where skills are measured by the educational composition of the firms' labor input. The study is based on a unique combination of data sets yielding a matched employer-employee sample containing information on output, labor inputs, and international trade, all measured at the firm level, and covering the period 1999-2002. This data set enables us to develop measures of international trade at a very detailed level, both in terms of the type of trade and in terms of the origins of the goods traded.

Specifically, our focus is international outsourcing and import penetration. We consider two testable hypotheses that are readily derived from standard trade models of comparative advantages:

- **Hypothesis 1:** The relative demand for skilled labor increases with the extent of international outsourcing to low-wage countries; both at the firm and industry level.

- **Hypothesis 2:** The relative demand for skilled labor increases with industry exposure to imports from low-wage countries.

Moreover, we study the effect on the relative demand for skilled labor of exposure to international trade from high-wage countries; both international outsourcing and import penetration. According to the standard comparative advantage trade models it is unclear whether the relative demand for skilled labor should increase, decrease, or remain unchanged in the case of increasing trade with high-wage countries, as we have no priors as to whether Danish manufacturing has comparative advantages in skilled or unskilled labor when compared to other high-wage countries.

International outsourcing is a measure of imported inputs to the production process - including the final stages of assembly - measured at the firm level. Import penetration is total imports at the (detailed) industry level and is a measure of foreign competition in product markets. For both types of international trade, we distinguish between trade with low-wage versus high-wage countries, in order to investigate if the impacts of trade are similar irrespective of origin.

Our main findings are that it is of crucial importance to distinguish international trade - whether in the form of outsourcing or import penetration - by country-of-origin. We find that international trade from low-wage countries - both international outsourcing and import penetration - leads to skill *upgrading* in Danish manufacturing firms. We also find that import penetration from high-wage countries leads to skill *downgrading*. The results established in relation to import-penetration suggests that Danish manufacturing has comparative advantages in processes that use *skilled* labor intensively when compared to low-wage countries and comparative advantages in processes that use *unskilled* labor intensively when compared to high-wage countries.

To evaluate the importance of internationalization for skill-upgrading, we calculate the (ceteris paribus) contributions of each explanatory variable to skill-upgrading. More precisely, we multiply the mean change in explanatory variables by the matching regression coefficients and divide it by the mean change in dependent variable. Doing this we find that import penetration from low-wage countries accounts around fifty percent of the shift towards skilled labor. This is by far the largest contributor in the analysis and emphasizes the importance of import penetration from low-wage countries for skill upgrading.

An important feature of globalization, and a driving mechanism for increasing skill upgrading in developed countries - in the sense of firms employing increasing fractions of workers with formal education - has been attributed to international outsourcing. Since the seminal work by Feenstra and Hanson (1996), the idea that firms offshore productive activities that use unskilled labor intensively to low-wage countries has been used intensively. Empirically, international outsourcing is often found to be of significant importance for skill upgrading, see Feenstra and Hanson 1996, 1999), and Feenstra (2004).

The relationship between international outsourcing and skill upgrading is usually investigated using aggregated measures of international outsourcing based on data from input-output tables, and hence, they do not distinguish between country-of-origin, i.e. they do not allow a decomposition of outsourcing to low- and high-wage countries; exceptions are Ekholm and Hakkala (2006), and Hijzen, Görg and Hine (2005). Moreover, such aggregated data exclude international outsourcing of the final stage of production, e.g., assembly; an activity where many low-wage countries have their comparative advantage, see Ng and Yeats (1999).

In this paper, measures of international outsourcing are based on imports at the firm level. We develop different measures of international outsourcing that differ with respect to the type of good, its origin, and the level of aggregation.

More precisely, the type of goods considered includes all imports into the firm, imports from foreign manufacturing industries only, and imports from the same foreign industry as that in which the firm is located. With respect to country of origin, we divide goods according to the level of GDP per capita in the originating country. The aggregation level varies from the single firm to 316 manufacturing industries and further to 55 manufacturing industries. The established results are robust to the use of different measures of international outsourcing.

Another important aspect of globalization is that increasing international competition in product markets that force domestic firms out of business or makes them change their product mix. However, import penetration is often argued to be without empirical relevance for skill upgrading. This view is supported by shift-share analyses, see for example Berman, Bound and Griliches (1994) and Autor, Katz and Krueger (1998). These studies find that within-industry effects dominate skill-upgrading, whereas between-industry effects explaining skill-upgrading are modest. This evidence is interpreted as indicating that increasing competition in final goods markets is without importance for skill upgrading, because trade is argued to affect the composition of skills through a changing industry structures.

A recent study by Bernard, Jensen and Schott (2006), however, finds that import penetration plays an important role in the sense that firms adjust their product mix in response to international trade pressures, especially, when exposure to competition from low-wage countries is high. This suggests that firms may shift towards more skill intensive activities as a consequence of increasing international competition in product markets and that this shift may take place within industries; the authors also find it crucial to distinguish import penetration by country-of-origin.

Inspired by the findings in Bernard, Jensen, and Schott (2006), we develop measures of import penetration broken down by country-of-origin. These measures are defined as the overall imports from specific foreign manufacturing industries, and indicate the extent of product market competition from abroad. Hence, we both introduce measures of international outsourcing and import penetration after country-of-origin. According to our knowledge, this is the first paper to include both aspects of internationalization for skill-upgrading.

Methodologically, our study is based on estimation of the translog cost function, hence, it allows for direct structural interpretation and inference. In order to strengthen the causal interpretation of the parameters of interest, we reformulate the translog equations in deviations from firm means, i.e. we specify a fixed effects type model, thus exploiting only within-firm variation for identification. Moreover, the different levels of aggregation used for the measures international outsourcing (e.g. aggregation at different manufacturing industry levels) is essentially an instrumental variables strategy, and thus it further strengthens the causal interpretation given to these parameters, while import penetration measures are by construction aggregate measures.

The next section describes the basic equations in the translog cost model and discusses the econometric strategy. Section 3 describes the data set applied in the analysis, as well as the constructed measures of international outsourcing, import penetration, and a proxy for a potentially confounding variable; skill-biased technological progress. Section 4 presents empirical results. Section 5 concludes.

2 Econometric Framework

Our empirical specification is based on the so-called translog cost function.[1] We log-linearize the cost function and follow the framework in Brown and Christensen (1981) assuming the different types of labor to be variable inputs and capital to be a quasi fixed input. What distinguish the present study are two important things, firstly the specification here applies to the firm level rather than the industry level, and second, as something new we add international trade measures assumed also to be quasi fixed inputs [2]. Below the model for two labor types is described, whereas the general model for more labor types - as well as a more detailed derivation of the translog cost function - is found in the appendix.

The translog cost function generates a wage cost share equation of the following form:

$$\begin{aligned} S_{\text{skilled},i,j,t} &= \alpha_{\text{skilled},i} + \beta_1 \ln\left(\frac{w_{\text{skilled},i,t}}{w_{\text{unskilled},i,t}}\right) + \beta_2 \ln\left(Y_{i,t}\right) + \beta_3 \ln\left(K_{i,t}\right) \\ &\quad + \beta_4 \ln\left(LWOUTS_{i,t}\right) + \beta_5 \ln\left(HWOUTS_{i,t}\right) \\ &\quad + \beta_6 \ln\left(LWPEN_{j,t}\right) + \beta_7 \ln\left(HWPEN_{j,t}\right) \\ &\quad + \beta_8 \ln\left(TECH_{i,t}\right) + \varepsilon_{\text{skilled},i,t} \end{aligned}$$

[1]The transcendental logarithmic function was developed in Kmenta (1967) to approximate the CES-function, later applications more closely related to this study is Christensen and Greene (1976) and Berndt (1991)

[2]A variable input is assume to be optimally used in the short run, where as a quasi fixed input is assumed not to be subject of short run optimization, but by second order effects they affect the decision of how to optimally use the variable inputs. It is standard in this literature to treat capital as quasi-fixed, see Brown and Christensen (1981). We further argue that the opening of new markets and technological progress possess the characters of quasi fixed inputs.

where $S_{\text{skilled},i,j,t}$ is the cost share of skilled labor to total labor costs in firm i, located in industry j, observed at time t. The cost share of skilled labor measures the firm's demand for skilled labor, which is derived using Shephard's lemma. $w_{\text{skilled}}/w_{\text{unskilled}}$ is the relative wage of skilled labor to unskilled labor, Y is total production, K is the capital stock, $OUTS$ is international outsourcing, PEN is import penetration, and $TECH$ is a variable measuring technology level. LW and HW denote low-wage and high-wage countries, respectively. $\alpha_{\text{skilled},i}$ is a firm fixed effect, and $\varepsilon_{\text{skilled},i,t}$ is an *i.i.d.* error term. The measures of import penetration is industry measures per se and as such they are labelled j.

In general estimating a translog cost function generates a series of wage cost share equations, one for each type of variable (labor) input. Imposing the standard restrictions of symmetry and homogeneity of 1 degree in prices allows us to reach the specification above where one of the equations are now redundant. In the case of two labor inputs, the estimates of the similar equation for the wage cost share of unskilled labor can be recovered from the symmetry restrictions without actually estimating the equation.

The translog cost function is also estimated for three skill levels, and in this case, the restrictions have to be incorporated directly into the estimation procedure. We refer the interested reader to the appendix where the general model for h types of labor is developed.

In what follows all regressions are performed using Fixed Effects estimation techniques, implying that the model parameters are identified using only variation in the explanatory variables within firms over time. In the three labor types classification, this implies that the cost share equations are specified in deviations from individual firm averages, and this equation is then estimated using restricted maximum likelihood, incorporating all the structural parameter restrictions. Hence, our hypothesis is not that the firms with most outsourcing or import penetration has the highest share of skilled labor, but rather that within a given firm an increase in outsourcing or import penetration will cause a change towards a larger share of skilled or educated workers.

Outsourcing measures at the firm level can be criticized due to endogeneity in the sense that they are determined simultaneously with the firm's decision regarding its skill composition. To alleviate these problems, we use an approach based on the aggregation of the firm specific variables to the most detailed manufacturing industry level. This implies that the endogeneity problem remains only to the extent that the endogeneity is industry specific. This is similar to an instrumental variables approach, where the instrumental variable is substituted for the endogenous variable directly rather than added in a two-stage regression, see for example Edin, Fredriksson, and Åslund (2003).

3 Data

The data used in this study mainly originate from administrative registers maintained by Statistics Denmark, from which we have constructed a matched employer-employee database covering the entire population of firms and workers. The sampling unit employed in this study is a 'private manufacturing firm', and we observe these annually over the period 1999 to 2002. Specifically, the data sets we use are the Danish Firm Integrated Database for Labor Market Research (FIDA), the External Trade Statistics, Input-Output Tables, and Supply and Use Tables from Statistics Denmark. Moreover, the OECD ANBERD database is applied to construct a proxy for skill-biased technological change.

In the following sub-sections we describe the construction of the samples used and the dependent and main explanatory variables. In sub-section 2.1 we focus on our individual data at the firm and person level, in sub-section 2.2 on how to construct the applied measures of international trade, and in sub-sections 2.3 we construct a proxy for skill-biased technological change based on R&D.

3.1 Data at the Firm Level

The FIDA database includes variables for the single firm. It is possible to identify all workers in each firm for each year, and for each worker we have access to detailed information on educational attainment and wages. The data thus permit us to construct wage cost shares for the different types of labor at the firm level. We perform the analyses based on two labor types and three labor types, respectively. The former classification groups labor in unskilled labor and labor with qualifying education, whereas the latter classification groups labor in unskilled labor, labor with vocational skills, and labor with academic education. The choice of dividing labor into three skill groups as well as the standard two groups is motivated by the educational system of Denmark, which basically consists of a vocational track and an academic track. This enables us to study the nature and composition of skill upgrading in more details.

In the two category classification, skilled labor includes all workers with formal qualifying education. In the three category classification, the category 'vocational education' includes individuals with vocational education and individuals with a short academic education. Vocational education is a mix of schooling and training in firms. The typical duration is 3 years. Short academic educations are typically rather short and also quite practically oriented, which motivates the grouping. Labor with academic education (in the three category classification) thus includes workers with medium or long academic education. Long academic education corresponds to the master level or more. Medium academic education corresponds to the bachelor level.

When analyzing two labor types, we include firms with more than 10 employees, while we restrict the sample to firms with more than 50 employees when the focus is on three labor types. These sampling restrictions are made in order to avoid the technical problem of many small firms having zero employees of a given skill type, which will be a problem in our model for relative labor demand, since it would not be strictly compatible with the translog cost model, where the relative wages of skilled and unskilled workers enters as an important explanatory variable. Table A1 in the appendix presents the share of firms with at least one employee of a given labor type. It is evident that the majority of firms with more than 10 employees employ unskilled workers as well as workers with formal skills. Moreover, we find that most firms with more than 50 employees employ all three labor types, i.e., unskilled, vocational, and academically educated workers. The few firms the does not employ all labor types are excluded from our sample. The FIDA database provides additional background information such as turnover and the capital stock measured by the value of fixed assets from the firms' balance sheet. Table A2 in the appendix shows the size of the different samples as well as the measure of turnover and capital. There are observations for around 5,500 firms with more than 10 employees and 1,400 firms with more than 50 employees per year. Even with this fairly large reduction in number of firms, our sample still represents approximately 80 per cent of the total manufacturing turnover.

Using the relative wage measure at the firm level may be problematic. Endogeneity of firms' wage policies is an issue that we cannot neglect, since wage policies are a crucial part of the strategic positioning of the firm in the context of globalization. To alleviate this problem we use in the empirical analysis the relative wage measured at the municipality level (*mun*) included in the analysis. The municipality group-specific wage measures are calculated from information on individual wage for all workers of all types.[3]

[3] Data on individual wages and working hours are aggregated to the municipality level for individuals working in the firms that are included in our sample. These aggregates are used to calculate the relevant hourly wage rate for each labor type in each of Denmark's 271 municipalities.

Table 1 presents total wage cost share composition and its development over the sampling period for the different samples of manufacturing firms. The main impression is that skill upgrading takes places over time even though the sample only covers four years. Even in this short period we are able to observe changing wage mix, as the share for people with no education falls with approximately 2 percentage point over the period (a pattern that is even more distinct focusing only at the number of workers with different education), and further this general pattern is confirmed to be matched in both of our sub-samples.

<Table 1 about here>

3.2 Measuring International Trade

We want to investigate the impact of globalization in the form of increasing international trade, especially with low-wage countries, on the relative demand for skilled and unskilled labor. Table 2 presents the overall import data for Danish firms. Despite the short time span, imports from low and middle-income countries have increased from 35 to 49 billions DKK from 1999 to 2002, an increase by more than one third, and a pattern we see repeated in both samples of manufacturing firms.

<Table 2 about here>

There are several ways of including these import values in the estimation. In the following the measures of international outsourcing and import penetration are described. The country-split that we apply are low and middle income countries (LW) and high income countries (HW) according to 2005 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, $875 or less; lower middle income, $876 -$3,465; upper middle income, $3,466 - $10,725; and high income, $10,726 or more. For the exact grouping see http://web.worldbank.org/.

3.2.1 International Outsourcing

The measures of international outsourcing applied here differ from measures based on data from input-output tables that are usually used in empirical studies, see for example Feenstra and Hanson (1999). In relation to previously used measures of outsourcing, we offer two improvements; (i) we distinguish between country-of-origin, and (ii) we include international outsourcing of the final stage of production, e.g., assembly; an activity where many developing countries have their comparative advantage, see Ng and Yeats (1999). Namely, we have access to international trade data by country-of-origin, and we have total imports in the individual manufacturing firm, implying that we have imports of both intermediate input and imports of goods from the final stage of production. According to our knowledge this paper is the first to develop measures with both of these features.[4]

Below we describe three measures of international outsourcing. These measures are constructed for the firm level as well as the industry level. Moreover, the measures are broken down in outsourcing to LW and HW countries. The measures are based on data for international trade at the firm level by country-of-origin and product type. These data are from the External Trade Statistics Register of Statistics Denmark that has been linked to the FIDA database. The main challenge in developing measures of international outsourcing is to convert the classification for imports by product type into a classification by industry affiliation.

In the External Trade Statistics, trade is categorized by type of product. In order to convert the product classification for imports to an industry classification, we apply supply-and-use tables for the relevant years (Statistics Denmark, 1986). These tables are based on approximately 2750 product accounts, where each product account contains information on the supply of a product type, i.e., we obtain information on domestic industries that produce a given product. This information enables us to convert imports by product type to imports by industry after DB111 industry classification covering 55 manufacturing industries. The implicit assumption behind this conversion is that foreign business structures are similar to the Danish in the sense that a product is produced in the same industry abroad and at home. The DB nomenclature is the Statistics Denmark's more disaggregated version of NACE rev. 1 industrial classification. We use this classification system

[4]A few studies have decomposed international outsourcing by country-of-origin. These are Ekholm and Hakkala (2006) for Sweden, Geishecker (2006) for Germany, and Anderton and Brenton (1999) for United Kingdom. In Ekholm and Hakkala (2006) and Geishecker (2006), measures of international outsourcing are based on input-output tables. Anderton and Brenton (1999) approximate international outsourcing by constructing import penetration measures for high- and low-wage countries for the United Kingdom that sub-divides international outsourcing into the country-groups. Other studies use imports at the firm level and thereby deal with point (ii) above. Görg, Hanley, and Strobl (2007) use international outsourcing measures based on micro data but they do not separate them by country-of-origin.

under different levels of aggregations implying 316 manufacturing industries (DB03), 55 industries (DB111), and 13 industries (DB53).

The first measure of international outsourcing is simply based on total imports in the individual firm in Danish manufacturing and therefore makes no use of supply-and-use tables. This measure may be criticized since it includes imports of e.g. energy and agricultural product etc.; that is, goods that are not typically associated with international outsourcing.

In order to overcome this critique, we develop two additional measures of international outsourcing; a narrow and a broad measure. The broad measure is defined as imports from foreign *manufacturing* industries. The narrow measure is defined as imports from the same foreign industry as that in which the manufacturing firm is located. Both measures are suggested by Feenstra and Hanson (1999).

These measures of international outsourcing in firm i, $OUTS_{i,DB111}^{\text{narrow}}$ $OUTS_{i,DB111}^{\text{broad}}$, and $OUTS_i^{\text{all}}$ are referring to the narrow measure, the broad measure, and the measure including total imports. They are defined as:

$$\begin{aligned} OUTS_{i,DB111}^{\text{narrow}} &= M_{i,j,k=j} \\ OUTS_{i,DB111}^{\text{broad}} &= \sum_{k}^{\text{Manu}} M_{i,j,k} \\ OUTS_i^{\text{all}} &= \sum_{k}^{\text{Total}} M_{i,j,k} \end{aligned}$$

where $M_{i,j,k}$ denote the import of firm i, located in domestic industry j, from foreign industry k. We see that , $OUTS_{i,DB111}^{\text{narrow}}$ only includes import from the same (DB111) industry as where firm i is located in the home country, $OUTS_{i,DB111}^{\text{broad}}$ includes import from all manufacturing industries, and $OUTS_i^{\text{all}}$ is the sum of all import to firm i.

Outsourcing measures at the firm level can be criticized due to endogeneity in the sense that they are determined simultaneously with the firm's decision regarding it's skill composition. To alleviate these problems, we use an instrumental variables approach, aggregating the outsourcing measures to the most detailed manufacturing industry level, based on the DB03 industry classification consisting of 316 manufacturing industries, and substituting this measure for the firm specific outsourcing measure.

$$
\begin{aligned}
OUTS^{\text{narrow}}_{DB03,DB111} &= \sum_{i \in DB03} \left[M_{i,j,k=j}\right] \\
OUTS^{\text{broad}}_{DB03,DB111} &= \sum_{i \in DB03} \left[\sum_{k}^{\text{Manu}} M_{i,j,k}\right] \\
OUTS^{\text{all}}_{DB03} &= \sum_{i \in DB03} \left[\sum_{k}^{\text{Total}} M_{i,j,k}\right]
\end{aligned}
$$

where industry measures $OUTS^{\text{narrow}}_{DB03,DB111}$, $OUTS^{\text{broad}}_{DB03,DB111}$, and $OUTS^{\text{all}}_{DB03}$ refer to the narrow measure, the broad measure, and the measure including total imports at the DB03 industry level, respectively.

The measures of external trade can be decomposed by country-of-origin:

$$OUTS^b_h = HWOUTS^b_h + LWOUTS^b_h$$

where $b = (narrow, broad, all)$, h refers to the aggregation level used, and HW denotes high-income countries and LW denotes low- and middle-income countries.

3.2.2 Import Penetration

Import penetration for a firm in a given manufacturing industry is measured as total imports from the same foreign manufacturing industry, and as such it indicates the extent of product market competition. The measure is an aggregate measure by nature and is therefore developed for the industry level. The measure is constructed using two data sources, namely, a unique version of the Danish Input-Output table for 2000 and the import data for Danish firms. We construct the measure by using the level of imports in manufacturing industries from the Input-Output table at the DB111 level covering 55 manufacturing industries and determine the development over time using the External Trade Statistics. The measures are calculated separately for imports from LW- and HW-countries.[5]

[5] As described in the main text, the construction of Input-Output tables is based on so-called supply-and-use tables. These tables are based on approximately 2750 product accounts. Each product account contains information on the supply of a product (domestic production by industry, import and supply of investment goods) and the use of a product (intermediate input, consumption, export, and supply inventories). To distinguish a product by country-of-origin, imports and exports of the product is combined with the country distribution of import and export for the

The difference between import penetration and international outsourcing is that the former measures total imports from individual foreign manufacturing industries, whereas the latter measures import from all (or some) foreign manufacturing industries to the individual Danish manufacturing industry or firm.

The measure of import penetration in industry $k \in DB111$ is defined as

$$PEN_k = \sum_{j}^{\text{Total}} M_{j,k}$$

where PEN_k refers to import penetration, and $M_{j,k}$ denotes the amount of import from foreign industry k to domestic industry j. The measures of import penetration are also calculated separately for LW- and HW-countries:

$$PEN_k = HWPEN_k + LWPEN_k$$

3.3 Skill-Biased Technological Change

It is difficult to procure measures for skill-biased technological changes. However, given the role of skill-biased technological change as a potential confounding variable, it is important to try to include a measure of it. In the literature, different variables have been used to capture the increasing efficiency of skilled and educated labor. Autor, Katz, and Krueger (1998) show that the diffusion of computers and related technologies is an important source of changes in the relative demand of skills and thereby in the relative efficiency of skilled labor.

We follow Machin and Van Reenen (1998), who use R&D intensities to explain skill upgrading. Hence, R&D intensities are used as measures of technological stage of development using the OECD ANBERD database. R&D data that are compatible with the applied databases, i.e., industry-structure ISIC Revision 3 within manufacturing, only exist for the DB53 level covering 13 such industries within manufacturing. R&D intensities are defined as R&D expenditures in an industry divided by industry production.

relevant product from the external trade statistics. After having calculated external trade by country-of-origin for all product accounts, the Input-Output table with external trade divided by country-of-origin is constructed using the standard method for constructing Input-Output tables, see Statistics Denmark (1986).

Table 3 contains a description of the main explanatory variables used in the empirical model specified below.

<Table 3 about here >

Note that all variables are measured in changes over time. Hence, the skilled workers' wage share increase by over two percentage points, while at the same time, their relative wages decline by two log-points. For both the measures of outsourcing and the measure of import penetration, we observe quite large increases over time, especially for outsourcing to low-wage countries.

4 Regression Results

Table 4 presents results using different measures of internationalization. Models 1-4 include the measure of international outsourcing based on all imports to individual manufacturing industries, i.e., $OUTS^{\text{all}}_{DB03}$, $LWOUTS^{\text{all}}_{DB03}$, and $HWOUTS^{\text{all}}_{DB03}$, where DB03 implies that we use the instrumental variable described in Section 2.2.1 above. It is evident that skill upgrading is more pronounced in firms located in industries with increasing international outsourcing to low-wage countries. Increasing outsourcing to high-wage countries does not appear to affect the relative demand for skilled labor; independent of whether we use instrument or firm specific outsourcing.[6]

<Table 4 about here>

Next we turn to import penetration in Models 5 and 6. In Model 5, it is seen that an overall measure of import penetration does not have a statistically significant impact on the relative demand for skilled labor. However, when calculating the measure separately for HW and LW countries in Model 6, we see that this overall picture hides important information. Namely, import penetration has very

[6] To allow our study more comparability to the existing literature on the effects of international trade on skill upgrading, we make a short deroute from our micro foundation and perform all regressions using trade intensities instead of our log specification. I.e., instead of e.g. $\ln(LWOUTS_{i,t})$ we include $\left(\frac{LWOUTS_{i,t}}{Y_i}\right)$. The results are reported in an appendix (Tables A3-A6). The results are similar to the results presented below, hence, we shall not discuss them further.

important effects on skill upgrading, but it is crucial to distinguish between imports from HW and LW countries; firms located in industries exposed to extensive import penetration from low-wage countries increase the relative demand for skilled labor more than other firms, while firms located in industries with high import levels from HW countries lower their relative demand for skilled labor, that is, import penetration from high-wage countries leads to skill downgrading. Overall, this picture suggests that Danish manufacturing firms have comparative advantages in skill-intensive production when compared to low-wage countries and comparative advantages in production processes intensive in unskilled labor when compared to other high-wage countries.

Finally, both the measures of international outsourcing and import penetration are included in Models 7 to 10. The main results are again that skill upgrading is affected positively by international outsourcing to low-wage countries and positively by import penetration from low-wage countries, whereas it is affected negatively by import penetration from high-wage countries.

Other explanatory variables also affect the relative demand for skilled relative to unskilled labor. It decreases in the relative price of skilled labor, and is more or less unaffected by the size of the firm in terms of its output. The measure of the capital stock does not appear to affect the relative demand for skilled versus unskilled labor. A potential explanation is that time series for physical capital are smooth and therefore it is difficult statistically to distinguish between a time trend and the development in physical capital, see for example Islam (1995). In all models presented in Table 4 the TECH variable capturing technological progress have a significant positive effect on the relative demand for skilled to unskilled labor.

The measures of international outsourcing applied in Table 4 may be criticized on the grounds that they include all imports, i.e., imports of e.g. energy and agricultural products are included. To overcome this critique, we re-estimate the models presented in Table 5 using $OUTS^{\text{broad}}_{DB03,DB111}$ and $OUTS^{\text{narrow}}_{DB03,DB111}$. It is evident that the conclusions of Table 4 are robust to the change in the measures of international outsourcing.

<Table 5 about here>

Next, we turn to the case with three labor types; unskilled, vocational, and academically educated workers. This division is of interest because it is interesting to investigate if skill upgrading takes place between unskilled labor and skilled labor or between unskilled labor and academically educated labor.

<Tables 6 about here>

The main results are presented in Table 6. For both groups of skilled labor, vocational and academically educated, the effects of international trade are more or less the same as in the two skill groups case. The relative demand for both vocational and academically educated labor is positively affected by import penetration from low-wage countries, whereas import penetration from high-wage countries leads to skill downgrading for both types of skilled labor. Moreover, import penetration from high-wage countries reduces the demand for both types of labor. However, when it comes to international outsourcing, the relative demand for vocationally educated labor is positively affected by outsourcing to low-wage countries, while in general, academically educated labor is not. Finally technological progress is seen to increase the demand for long educated labor in relations to unskilled labor only, since vocational labor is seen to be unaffected.

It is evident from Table 6 that higher wages of vocational workers in relation to wages of unskilled workers lead to lower demand for vocational skills. Surprisingly, such a conclusion can not be made for academic workers, since a wage increase for this group in relation to unskilled workers lead to higher relative demand for academic workers. This result can arise because the relative wage for academic workers enters in the wage share of the group. When the relative wage rate for academic workers increases, this can result in a higher wage share even when the employment share decreases and can be due to low substitutability between academic and unskilled workers and possibly by a larger degree of inertia in layoffs within this group (due to contractional bindings and that they most likely are harder to replace). The likelihood for this result increases when the time period under investigation is short as in the present study. We have estimated the regressions of Table 6 using employment shares as dependent variable and find that higher relative wages of both vocational and academic education lead to lower demand for the two education lengths, respectively.

It is also seen that the effect on skill-upgrading from changing relative cross wages are negative. Taken at face value this suggests that workers with vocational education and workers with academic educations are complements, i.e., when the relative wage for vocational skills increases, the demand for both skill types decreases. It could, however, also be due to correlation between the two relative wages, which could potentially generate the negative correlation between changing relative cross wages and changing wage shares. Our regressions based on the employment share as dependent variable, suggest that this is the case.

Demand for vocational skilled workers seems to be mostly unaffected by firm size and capital stock, where as the demand for long educated is decreasing in firm size and as expected increasing in total amount of capital.

<Table 7 about here>

Again we re-estimate model (5) and (6) from table 6 using $OUTS^{\text{broad}}_{DB03,DB111}$ and $OUTS^{\text{narrow}}_{DB03,DB111}$. Table 7 contains the results. Again we conclude that the results of Table 6 are fairly robust to the change in the measures of international outsourcing, even though outsourcing from low wage countries does loose its significance in its explanatory power on the demand for vocational educated workers.

4.1 Empirical Importance of Internationalization

In order to assess the empirical importance for skill upgrading of the various explanatory variables, we calculate average contributions to skill upgrading using

$$\begin{aligned}
&\beta_1 \Delta \ln \left(\frac{w_{\text{skilled},mun}}{w_{\text{unskilled},mun}} \right) / \Delta S_{\text{skilled}} + \beta_2 \Delta \ln \left(Y_{i,t} \right) / \Delta S_{\text{skilled}} + \beta_3 \Delta \ln \left(K_{i,t} \right) / \Delta S_{\text{skilled}} \\
&+\beta_4 \Delta \ln \left(LWOUTS^b_{h,t} \right) / \Delta S_{\text{skilled}} + \beta_5 \Delta \ln \left(HWOUTS^b_{h,t} \right) / \Delta S_{\text{skilled}} \\
&+\beta_6 \Delta \ln \left(LWPEN_{k,t} \right) / \Delta S_{\text{skilled}} + \beta_7 \Delta \ln \left(HWPEN_{k,t} \right) / \Delta S_{\text{skilled}} \\
&+\beta_8 \Delta \ln \left(TECH_{DB53,t} \right) / \Delta S_{\text{skilled}} = 1
\end{aligned}$$

where the Δ refers to the change in the mean of the variable in question from 1999 to 2002. It is important to emphasize that the contributions determined using this method are ceteris paribus contributions.

This method enables us to investigate the importance of the increasing international trade patterns that may contribute to explaining the observed development in the relative demand for skilled labor.

<Tables 8 about here>

The results are presented in Table 8. It is found that increasing import penetration from low-wage countries on average contributes as much as 40 percent of skill-upgrading. The result suggests that import penetration from low-wage countries may be a more considerable driver for skill-upgrading than any other driver included in the regression.

Turning to the same exercise for 3 types of labor, it is found that the ceteris paribus contribution to skill-upgrading from import penetration from low-wage countries is an astonishing 60 percent for academic education, whereas it equals 20 percent for vocational education. The results are presented in Table 9.

<Tables 9 about here>

5 Conclusion

This paper studies the relationship between skill-upgrading and internationalization. The study is based on a unique data set for Danish Manufacturing that enables us to develop measures of international outsourcing and import penetration that focus on where imports originate rather than on their overall level. The main finding suggests that it is of crucial importance to distinguish import by country-of-origin. It is found that international trade from low-wage countries - both international outsourcing and import penetration - lead to skill-*upgrading*. Moreover, we find that import penetration from high-wage countries lead to skill-*downgrading*.

To evaluate the importance of internationalization for skill-upgrading, we determine the (ceteris paribus) contributions of each explanatory variable to skill-upgrading. Doing this we find that import penetration from low-wage countries accounts around fifty percent of the shift towards skilled labor. This is by far the largest contributor in the analysis and emphasizes the importance of import penetration from low-wage countries for skill upgrading.

The main result that import penetration from low-wage countries is of great importance for skill-upgrading; especially, for academic education, are really interesting and important. The importance of import penetration for skill-upgrading has to a large degree been disregarded in the literature for a long time and the focus has mainly been on international outsourcing. In the Journal of Economic Perspective summer 1995 there was a symposium on income inequality and trade. For example, Wood (1995) "..argue[s] for what is still a minority view among economists: that the main cause of the deteriorating situation of unskilled workers in developed countries has been expansion of trade with developing countries." This is not a view that has had any power of penetration. Our result is somewhat related to the view by Wood since we find that the fall in demand for unskilled labor relative to skilled labor is greatly influenced by increasing import penetration from developing countries.

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A Appendix 1: The Model in the general case of H-types of workers

We analyze the relationship between globalization and the firm's relative demand for different types of labor within a factor demand framework. The estimated system of equations is derived from a simple quasi-fixed translog cost function (Christensen and Greene 1976, Brown and Christensen 1981, Berndt 1991).

The starting point is the cost function $C(Y, p)$ denoting the minimum cost of producing Y at given prices p evaluated at the relevant cost-minimizing choice of inputs. By expanding the log of the cost function $\ln C(Y_{it}, p_{iht})$ in a second order Taylor series about the point $p_{iht} = 0, Y_{it} = 0$, where p_{iht} denote input prices for type h labor, and Y_{it} the output in firm i at time t, we obtain

$$\begin{aligned}
\ln C(Y_{it}, p_{iht}) &= \beta_0 + \sum_{h=1}^{H} \frac{\partial \ln C_{it}}{\partial \ln p_{iht}} \ln p_{iht} + \frac{\partial \ln C_{it}}{\partial \ln Y_{it}} \ln Y_{it} \\
&+ \frac{1}{2} \sum_{h=1}^{H} \sum_{m=1}^{H} \frac{\partial^2 \ln C_{it}}{\partial \ln p_{iht} \partial \ln p_{imt}} \ln p_{iht} \ln p_{imt} \\
&+ \frac{1}{2} \frac{\partial^2 \ln C_{it}}{\partial \ln Y_{it} \partial \ln Y_{it}} (\ln Y_{it})^2 + \frac{1}{2} \sum_{h=1}^{H} \frac{\partial^2 \ln C_{it}}{\partial \ln Y_{it} \partial \ln p_{iht}} \ln Y_{it} \ln p_{iht}
\end{aligned}$$

This cost function may contain both variable and quasi-fixed inputs in the vector p_{iht}. In our case the variable inputs are different types of workers (by education groups), with cost given by the wages $\sum_{h=1}^{H} w_h$.

Quasi-fixed inputs can be seen as inputs that are not used optimally (in a long run sense) in the short run, but are important for the production process. First, we assume the amount of physical capital K to be quasi-fixed, implying that firms cannot adjust capital in the short run. Second, our hypothesis is that the production process in terms of the labor composition might be influenced by international trade, especially, from low wage countries. Therefore, international outsourcing $OUTS$ and import penetration PEN are included as quasi-fixed inputs along with measures of technological progress $TECH$.

Further identifying the derivatives as our parameters of interest the cost function can be expressed as:

$$\begin{gathered}
\ln C_{it} = \beta_0 + \textstyle\sum_{h=1}^{H} \alpha_h^w \ln w_{iht} + \alpha^Y \ln Y_{it} + \alpha^K \ln K_{it} + \alpha^o \ln OUTS_{it} + \alpha^o \ln PEN_{it} \\
+\alpha^o \ln TECH_{it} + \tfrac{1}{2} \textstyle\sum_{h=1}^{H} \sum_{m=1}^{H} \beta_{hm}^w \ln w_{iht} \ln w_{imt} + \sum_{h=1}^{H} \beta_h^Y \ln w_{iht} \ln Y_{it} \\
+ \textstyle\sum_{h=1}^{H} \beta_h^K \ln w_{iht} \ln K_{it} + \sum_{h=1}^{H} \beta_h^o \ln w_{iht} \ln o_{it} \\
+ \textstyle\sum_{h=1}^{H} \beta_h^o \ln w_{iht} \ln PEN_{it} + \sum_{h=1}^{H} \beta_h^o \ln w_{iht} \ln TECH_{it}
\end{gathered} \tag{1}$$

Now define S_{iht} as the type h variable cost share of total cost:

$$S_{iht} = \frac{w_{iht}L_{iht}}{\sum_{m=1}^{H}(w_{imt}L_{imt})} \tag{2}$$

where L_{iht} denotes the number of workers of type h in firm i at time t.

Using Shephard's lemma and Young's rule minimizing with respect to the variable costs we can generate a series of h variable wage cost share equations of the familiar form:

$$\begin{aligned}\sum_{h=1}^{H} S_{iht} &= \frac{\partial \ln C_{it}}{\partial \ln w_{iht}} = \alpha_h + \sum_{m=1}^{H} \beta^{w}_{hm} \ln w_{imt} + \beta^{Y}_{h} \ln Y_{it} + \beta^{K}_{h} \ln K_{it} \\ &+\beta^{o}_{h} \ln OUTS_{it} + \beta^{PEN}_{h} \ln PEN_{it} + \beta^{TECH}_{h} \ln TECH_{it}\end{aligned} \tag{3}$$

Next structural restrictions of symmetry and homogeneity of degree one in prices are imposed on the model. This leads to the following restrictions:

Symmetry:

$$\beta^{w}_{hm} = \beta^{w}_{mh},\ \forall\ h \neq m \tag{R1}$$

Homogeneity:

Denoting the number of variable cost inputs h and the total number of variables m, this implies $m+1$ cross equation restrictions:

$$\sum_{h=1}^{H} \alpha_h = 1, \qquad \sum_{h=1}^{H} \beta^{w}_{hm} = 0\ \forall\ m, \qquad \sum_{h=1}^{H} \beta^{m}_{h} = 0, \qquad \sum_{h=1}^{H} \beta^{Y}_{h} = 0 \quad \text{and} \quad \sum_{h=1}^{H} \beta^{Q}_{h} = 0 \tag{R2}$$

and h within equation restriction[7]:

$$\sum_{m=1}^{H} \beta^{w}_{hm} = 0\ \forall\ h \tag{R3}$$

The symmetry restrictions in $(R1)$ are simply forced upon our model using a full information simultaneous maximum likelihood estimation approach. Where as the

[7] Note that with symmetry imposed these are actually redundant!

cross and within equation restrictions in $(R2)$ and $(R3)$ are imposed by the division with one of the price variables (here for simplicity, we choose the log wages of those persons with the lowest qualifying education denoted by $\ln w_1$), in each equation.

This leaves us with a singular system of equations, where all parameters are included twice, a problem which is circumvented by leaving out the first equation. Therefore, the following system of $H-1$ equations is estimated:

$$\sum_{h=2}^{H} S_{iht} = \sum_{h=2}^{H} \left(\alpha_h + \sum_{m=2}^{H} \beta_{hm}^{w} \ln \left(\frac{w_{imt}}{w_{i1t}} \right) + \beta_h^Y \ln Y_{it} + \beta_h^K \ln K_{it} + \beta_h^Q \ln Q_{it} \right) \quad (4)$$

imposing the assumption of symmetry in $(R1)$. Finally, the restrictions in $(R2)$ and $(R3)$ are used to recover the parameter estimates of type 1 workers.

B Appendix 2: Appendix tables

<Table A1 about here>

<Table A2 about here>

<Table A3 about here>

<Table A4 about here>

<Table A5 about here>

<Table A6 about here>

Table 1: Total Wage Cost Shares Composition in Danish Manufacturing

	1999	2000	2001	2002
	------------------- **All Manufacturing Firms** -------------------			
Total Number of Workers	442,597	448,388	441,375	427,669
Wage: No Education	33.9%	33.6%	32.7%	31.9%
Wage: Vocational Education	44.5%	44.8%	44.9%	44.8%
Wage: Short Academic Education	6.4%	6.5%	6.7%	7.0%
Wage: Medium Academic Education	9.2%	9.1%	9.2%	9.3%
Wage: Long Academic Education	6.0%	6.1%	6.5%	6.9%
	----- **Manufacturing Firms with 10 or More Employees** -----			
Total Number of Workers	401,381	408,741	401,706	390,666
Wage: No Education	33.9%	33.5%	32.6%	31.9%
Wage: All Educations	66.1%	66.5%	67.4%	68.1%
	----- **Manufacturing Firms with 50 or More Employees** -----			
Total Number of Workers	320,207	329,516	323,802	314,869
Wage: No Education	34.3%	33.9%	33.0%	32.2%
Wage: Vocational or Short Academic Education	48.4%	49.0%	49.4%	49.5%
Wage: Medium or Long Academic Education	17.3%	17.1%	17.6%	18.3%

Table 2: Imports in Danish Firms by Country-of-Origin's Income per Capita.

	1995	1996	1997	1998	1999	2000	2001	2002
	All Firms							
Total	256.1	261.0	293.1	309.8	310.6	358.9	331.0	346.4
High Income OECD Countries	220.9	223.8	249.8	264.8	263.3	299.1	269.2	284.8
High Income Non-OECD Countries	7.1	7.0	8.0	8.3	8.8	12.1	9.8	9.9
Upper Middle Income Countries	13.5	14.5	16.4	17.8	19.0	24.0	28.4	28.0
Lower Middle Income Countries	9.7	10.3	13.7	13.5	14.1	17.3	17.1	16.7
Low Income Countries	2.7	3.2	2.9	3.2	3.0	3.7	3.9	4.2
Unknown	2.1	2.1	2.3	2.3	2.4	2.7	2.7	2.7
					All Manufacturing Firms			
Low and Middle Income Countries					10.9	12.7	14.6	14.2
High Income Countries					61.2	69.7	79.6	80.3
					Manufacturing Firms with 10 or More Employees			
Low and Middle Income Countries					10.5	12.3	14.0	13.8
High Income Countries					60.1	68.5	77.8	79.0
					Manufacturing Firms with 50 or More Employees			
Low and Middle Income Countries					8.6	10.3	11.9	11.3
High Income Countries					53.8	61.1	70.0	70.3

Table 3. Mean values over firms, change from1999-2002, all variables.

	2 groups				3 groups		
	Mean	Std dev	Obs		Mean	Std dev	Obs
GENERAL EXPLANATORY VARIABLES							
Wage Share, skilled	0.02	0.26	4814				
Wage Share, vocational skills					0.02	0.19	1355
Wage Share, long education					0.01	0.17	1355
Relative $wage_{mun}$, skilled	-0.02	0.09	4814				
Relative $wage_{mun}$, vocational skills					-0.02	0.09	1355
Relative $wage_{mun}$, long education					-0.01	0.16	1355
$\ln(Y_i)$	0.17	1.78	4814		0.18	1.46	1355
$\ln(K_i)$	0.16	1.98	4814		0.19	1.72	1355
OUTSOURCING							
$\ln(OUTS_{DB03}^{all})$	0.26	2.29	4801		0.16	2.36	1353
$\ln(LWOUTS_{DB03}^{all})$	0.54	3.18	4591		0.41	3.18	1288
$\ln(HWOUTS_{DB03}^{all})$	0.23	2.26	4798		0.14	2.33	1353
$\ln(OUTS_{DB03,DB111}^{broad})$	0.24	2.30	4793		0.15	2.38	1352
$\ln LWOUTS_{DB03,DB111}^{broad})$	0.56	3.31	4558		0.36	3.27	1262
$\ln(HWOUTS_{DB03,DB111}^{broad})$	0.22	2.26	4788		0.13	2.35	1352
$\ln(OUTS_{DB03,DB111}^{narrow})$	0.32	2.61	4744		0.24	2.73	1327
$\ln(LWOUTS_{DB03,DB111}^{narrow})$	0.31	3.42	3992		0.25	3.39	1140
$\ln(HWOUTS_{DB03,DB111}^{narrow})$	0.27	2.58	4741		0.19	2.71	1326
IMPORT PENETRATION							
$\ln(PEN_{DB111})$	0.10	1.77	4814		0.07	2.04	1355
$\ln(LWPEN_{DB111})$	0.44	1.99	4814		0.40	2.27	1355
$\ln(HWPEN_{DB111})$	0.06	1.77	4814		0.03	2.05	1355
R&D							
$\ln(TECH_{DB53})$	0.39	2.16	4806		0.38	2.17	1352

Note: Only firms with values different from zero in 1999 and 2002 are included for each variable.

Table 4: Change in Skilled Wage Share as Dependent Variable, 1999-2002,
Fixed Effects Estimation Two Education Groups, Outsourcing Measures $OUTS^{all}_{DB03}$ and $OUTS^{all}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Relative wage$_{mun}$, skilled	-0,0466	-0,0466	-0,0441	-0,0466	-0,0483	-0,0213	-0,0466	-0,0468	-0,0205	-0,0211
	(3.24)**	(3.24)**	(3.07)**	(3.25)**	(3.36)**	(1,47)	(3.24)**	(3.26)**	(1,41)	(1,45)
ln(Y_i)	-0,0029	-0,0028	-0,0031	-0,0030	-0,0027	-0,0047	-0,0029	-0,0028	-0,0048	-0,0049
	(1,47)	(1,44)	(1,59)	(1,55)	(1,36)	(2.40)*	(1,48)	(1,44)	(2.46)*	(2.48)*
ln(K_i)	-0,0011	-0,0011	-0,0012	-0,0011	-0,0011	-0,0014	-0,0011	-0,0010	-0,0014	-0,0014
	(0,71)	(0,67)	(0,72)	(0,70)	(0,65)	(0,87)	(0,68)	(0,64)	(0,88)	(0,89)
ln($OUTS_{DB03}$)	0,0014						0,0015			
	(2.12)*						(2.32)*			
ln(OUTS)		-0,0004						-0,0004		
		(0,86)						(0,82)		
ln($LWOUTS_{DB03}$)			0,0021						0,0011	
			(4.09)**						(2.22)*	
ln($HWOUTS_{DB03}$)			-0,0002						-0,0001	
			(0,24)						(0,10)	
ln(LWOUTS)				0,0011						0,0010
				(2.32)*						(2.16)*
ln(HWOUTS)				-0,0005						-0,0004
				(1,18)						(0,96)
ln(PEN_{DB111})					-0,0015		-0,0017	-0,0014		
					(1,53)		(1,79)	(1,47)		
ln($LWPEN_{DB111}$)						0,0176			0,0167	0,0173
						(10.84)**			(10.07)**	(10.58)**
ln($HWPEN_{DB111}$)						-0,0187			-0,0181	-0,0183
						(10.47)**			(10.01)**	(10.22)**
ln($TECH_{DB53}$)	0,0051	0,0050	0,0051	0,0050	0,0055	0,0029	0,0054	0,0052	0,0030	0,0028
	(4.94)**	(4.81)**	(4.89)**	(4.75)**	(5.24)**	(2.75)**	(5.14)**	(4.97)**	(2.81)**	(2.62)**
Observations	20184	20184	20184	20184	20184	20184	20184	20184	20184	20184
Number of Firms	6612	6612	6612	6612	6612	6612	6612	6612	6612	6612

Note: * significant at 5 % level; ** significant at 1 % level

Table 5: Change in Skilled Wage Share as Dependent Variable, 1999-2002,
Fixed Effects Estimation Two Education Groups, Outsourcing Measures $OUTS^{narrow}_{DB03,DB111}$ and $OUTS^{broad}_{DB03,DB111}$

	$\Omega = OUTS^{broad}_{DB03,DB111}$	$\Omega = OUTS^{broad}_{DB03,DB111}$	$\Omega = OUTS^{narrow}_{DB03,DB111}$	$\Omega = OUTS^{narrow}_{DB03,DB111}$
	(11)	(12)	(13)	(14)
Relative wage$_{mun}$, skilled	-0,0464	-0,0204	-0,0465	-0,0234
	(3.23)**	(1,40)	(3.23)**	(1,61)
ln(Y_i)	-0,0029	-0,0048	-0,0029	-0,0049
	(1,48)	(2.45)*	(1,47)	(2.51)*
ln(K_i)	-0,0011	-0,0014	-0,0011	-0,0013
	(0,68)	(0,89)	(0,69)	(0,82)
ln(Ω)	0,0017		0,0015	
	(2.56)*		(2.44)*	
ln(LWΩ)		0,0009		0,0006
		(1,89)		(1,58)
ln(HWΩ)		0,0000		0,0003
		(0,03)		(0,56)
ln(PEN_{DB111})	-0,0017		-0,0017	
	(1,79)		(1,77)	
ln($LWPEN_{DB111}$)		0,0168		0,0171
		(10.12)**		(10.36)**
ln($HWPEN_{DB111}$)		-0,0181		-0,0184
		(10.05)**		(10.26)**
ln($TECH_{DB53}$)	0,0054	0,0030	0,0053	0,0030
	(5.15)**	(2.83)**	(5.04)**	(2.82)**
Observations	20184	20184	20184	20294
Number of Firms	6612	6612	6612	6649

Note: * significant at 5 % level; ** significant at 1 % level

Table 6: Change in Skilled and Educated Wage Share as Dependent Variable, 1999-2002,
Fixed Effects Estimation, Three Education Groups, Outsourcing Measures $OUTS^{all}$ and $OUTS^{all}_{DB03}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	------------------ Wage Share, Vocational Education ------------------									
Relative wage$_{mun}$, Vocational skills	-0,0161	-0,0167	-0,0166	-0,0169	-0,0178	-0,0086	-0,0159	-0,0163	-0,0077	-0,0082
	(1,15)	(1,19)	(1,18)	(1,20)	(1,27)	(0,61)	(1,13)	(1,17)	(0,55)	(0,58)
Relative wage$_{mun}$, Long education	-0,0265	-0,0264	-0,0265	-0,0262	-0,0263	-0,0234	-0,0264	-0,0262	-0,0235	-0,0233
	(4.40)**	(4.37)**	(4.39)**	(4.35)**	(4.36)**	(3.89)**	(4.38)**	(4.35)**	(3.92)**	(3.87)**
ln(Y_i)	0,0037	0,0034	0,0038	0,0033	0,0043	0,0029	0,0037	0,0034	0,0025	0,0021
	(1,76)	(1,61)	(1,84)	(1,55)	(2.07)*	(1,41)	(1,75)	(1,59)	(1,20)	(0,98)
ln(K_i)	-0,0014	-0,0012	-0,0013	-0,0013	-0,0012	-0,0018	-0,0014	-0,0012	-0,0018	-0,0019
	(0,68)	(0,58)	(0,63)	(0,65)	(0,62)	(0,92)	(0,69)	(0,59)	(0,89)	(0,93)
ln($OUTS_{DB03}$)	0,0023						0,0023			
	(3.80)**						(3.66)**			
ln(OUTS)		-0,0002						-0,0262		
		(0,57)						(4.35)**		
ln($LWOUTS_{DB03}$)			0,0012						0,0008	
			(2.68)**						(1,68)	
ln($HWOUTS_{DB03}$)			0,0006						0,0008	
			(0,81)						(1,19)	
ln(LWOUTS)				-0,0004						-0,0004
				(1,40)						(1,31)
ln(HWOUTS)				0,0013						0,0015
				(0,33)						(0,40)
ln(PEN_{DB111})					0,0014		0,0010	0,0014		
					(1,51)		(1,16)	(1,51)		
ln($LWPEN_{DB111}$)						0,0102			0,0099	0,0097
						(6.76)**			(6.47)**	(6.38)**
ln($HWPEN_{DB111}$)						-0,0090			-0,0089	-0,0086
						(5.30)**			(5.22)**	(4.99)**
ln($TECH_{DB53}$)	0,0016	0,0014	0,0017	0,0013	0,0015	0,0002	0,0015	0,0013	0,0004	0,0000
	(1,69)	(1,44)	(1,82)	(1,36)	(1,58)	(0,22)	(1,59)	(1,30)	(0,37)	(0,03)

Table 6: Change in Skilled and Educated Wage Share as Dependent Variable, 1999-2002 - **(continued)**

	------------------ Wage Share, Academic Education ------------------									
Relative wage$_{mun}$, Vocational skills	-0,0265	-0,0264	-0,0265	-0,0262	-0,0263	-0,0234	-0,0264	-0,0262	-0,0235	-0,0233
	(4.40)**	(4.37)**	(4.39)**	(4.35)**	(4.36)**	(3.89)**	(4.38)**	(4.35)**	(3.92)**	(3.87)**
Relative wage$_{mun}$, Long education	0,0308	0,0308	0,0306	0,0307	0,0309	0,0317	0,0309	0,0309	0,0316	0,0315
	(5.76)**	(5.75)**	(5.73)**	(5.73)**	(5.78)**	(5.96)**	(5.78)**	(5.77)**	(5.95)**	(5.93)**
ln(Y_i)	-0,0173	-0,0172	-0,0174	-0,0173	-0,0174	-0,0191	-0,0174	-0,0173	-0,0191	-0,0188
	(10.30)**	(10.09)**	(10.38)**	(10.14)**	(10.40)**	(11.43)**	(10.31)**	(10.11)**	(11.36)**	(11.07)**
ln(K_i)	0,0105	0,0104	0,0101	0,0103	0,0104	0,0097	0,0105	0,0104	0,0095	0,0096
	(6.49)**	(6.44)**	(6.25)**	(6.37)**	(6.42)**	(6.03)**	(6.48)**	(6.43)**	(5.92)**	(5.98)**
ln($OUTS_{DB03}$)	-0,0003						-0,0004			
	(0,61)						(0,77)			
ln(OUTS)		-0,0002						-0,0002		
		(0,57)						(0,61)		
ln($LWOUTS_{DB03}$)			0,0012						0,0006	
			(3.17)**						(1,76)	
ln($HWOUTS_{DB03}$)			-0,0009						-0,0006	
			(1,59)						(1,09)	
ln(LWOUTS)				0,0003						0,0003
				(1,36)						(1,14)
ln(HWOUTS)				-0,0004						-0,0004
				(1,40)						(1,31)
ln(PEN_{DB111})					0,0012		0,0011	0,0012		
					(1,61)		(1,56)	(1,63)		
ln($LWPEN_{DB111}$)						0,0116			0,0112	0,0115
						(9.62)**			(9.21)**	(9.41)**
ln($HWPEN_{DB111}$)						-0,0104			-0,0101	-0,0102
						(7.60)**			(7.37)**	(7.44)**
ln($TECH_{DB53}$)	0,0050	0,0051	0,0050	0,0049	0,0050	0,0034	0,0049	0,0050	0,0034	0,0034
	(6.42)**	(6.61)**	(6.44)**	(6.37)**	(6.43)**	(4.35)**	(6.26)**	(6.43)**	(4.25)**	(4.31)**
Observations	5651	5651	5651	5651	5651	5651	5651	5651	5651	5651

Note: * significant at 5 % level; ** significant at 1 % level

Table 7: Change in Skilled and Educated Wage Share as Dependent Variable, 1999-2002, Fixed Effects Estimation, Three Education Groups, Outsourcing Measures $OUTS^{broad}_{DB03,DB111}$ and $OUTS^{narrow}_{DB03,DB111}$

	$\Omega = OUTS^{bro}_{DB}$	$\Omega = OUTS^{broad}_{DB03,DB111}$	$\Omega = OUTS^{narrow}_{DB03,DB111}$	$\Omega = OUTS^{narrow}_{DB03,DB111}$
	(11)	**(12)**	**(13)**	**(14)**
	------------------- Wage Share, Vocational Education -------------------			
Relative wage$_{mun}$, Vocational skills	-0,0161	-0,0076	-0,0181	-0,0078
	(1,15)	(0,54)	(1,29)	(0,55)
Relative wage$_{mun}$, Long education	-0,0264	-0,0234	-0,0260	-0,0234
	(4.38)**	(3.88)**	(4.31)**	(3.88)**
ln($Y_{i,}$)	0,0038	0,0025	0,0043	0,0029
	(1,80)	(1,20)	(2.07)*	(1,40)
ln($K_{i,}$)	-0,0014	-0,0019	-0,0012	-0,0019
	(0,68)	(0,96)	(0,62)	(0,97)
ln(Ω)	0,0020		0,0000	
	(3.38)**		(0,01)	
ln(LWΩ)		0,0004		0,0005
		(0,95)		(1,27)
ln(HWΩ)		0,0013		-0,0006
		(2.05)*		(0,97)
ln(PEN_{DB111})	0,0011		0,0014	
	(1,24)		(1,50)	
ln($LWPEN_{DB111}$)		0,0099		0,0103
		(6.46)**		(6.73)**
ln($HWPEN_{DB111}$)		-0,0089		-0,0091
		(5.20)**		(5.33)**
ln(TECH $_{DB53}$)	0,0015	0,0003	0,0015	0,0003
	(1,59)	(0,30)	(1,56)	(0,34)
	------------------- Wage Share, Academic Education -------------------			
Relative wage$_{mun}$, Vocational skills	-0,0264	-0,0234	-0,0260	-0,0234
	(4.38)**	(3.88)**	(4.31)**	(3.88)**
Relative wage$_{mun}$, Long education	0,0310	0,0316	0,0311	0,0317
	(5.79)**	(5.95)**	(5.81)**	(5.97)**
ln($Y_{i,}$)	-0,0173	-0,0190	-0,0178	-0,0195
	(10.30)**	(11.33)**	(10.59)**	(11.63)**
ln($K_{i,}$)	0,0105	0,0096	0,0103	0,0096
	(6.47)**	(6.00)**	(6.40)**	(5.98)**
ln(Ω)	-0,0005		0,0013	
	(1,03)		(2.71)**	
ln(LWΩ)		0,0007		0,0008
		(2.10)*		(2.55)*
ln(HWΩ)		-0,0010		0,0004
		(1.97)*		(0,92)
ln(PEN_{DB111})	0,0012		0,0010	
	(1,58)		(1,34)	
ln($LWPEN_{DB111}$)		0,0112		0,0110
		(9.11)**		(8.99)**
ln($HWPEN_{DB111}$)		-0,0100		-0,0100
		(7.29)**		(7.31)**
ln(TECH $_{DB53}$)	0,0049	0,0035	0,0048	0,0035
	(6.30)**	(4.39)**	(6.23)**	(4.45)**
Observations	5651	5651	5651	5651

Note: * significant at 5 % level; ** significant at 1 % level

Table 8: (Ceteris Paribus) Contributions of Explanatory Variables to Skill-Upgrading – Two Category Classification of Skills

	(1)	(3)	(5)	(6)	(7)	(9)	(11)	(12)	(13)	(14)
Relative wage$_{mun}$, skilled	4%	4%	4%	2%	4%	2%	4%	2%	4%	2%
ln($Y_{i,}$)	-2%	-3%	-2%	-4%	-3%	-4%	-3%	-4%	-2%	-4%
ln($K_{i,}$)	-1%	-1%	-1%	-1%	-1%	-1%	-1%	-1%	-1%	-1%
ln($OUTS_{DB03}$)	2%				2%		2%		2%	
ln($LWOUTS_{DB03}$)		6%				3%		3%		1%
ln($HWOUTS_{DB03}$)		0%				0%		0%		0%
ln(PEN_{DB111})			-1%		-1%		-1%		-1%	
ln($LWPEN_{DB111}$)				40%		39%		39%		39%
ln($HWPEN_{DB111}$)				-6%		-6%		-6%		-6%
ln($TECH_{DB53}$)	10%	10%	11%	6%	11%	6%	11%	6%	11%	6%

Table 9: (Ceteris Paribus) Contributions of Explanatory Variables to Skill-Upgrading – Three Category Classification of Skills

	(1)	(3)	(5)	(6)	(7)	(9)	(11)	(12)	(13)	(14)
	------------------- **Wage Share, Vocational Education** -------------------									
Relative wage$_{mun}$, Vocational skills	1,4%	1%	2%	1%	1%	1%	1%	1%	2%	1%
Relative wage$_{mun}$, Long education	1,5%	2%	2%	1%	2%	1%	2%	1%	1%	1%
ln($Y_{i,}$)	3%	4%	4%	3%	3%	2%	4%	2%	4%	3%
ln($K_{i,}$)	-1%	-1%	-1%	-2%	-1%	-2%	-1%	-2%	-1%	-2%
ln($OUTS_{DB03}$)	2%				2%		2%		0%	
ln($LWOUTS_{DB03}$)		3%				2%		1%		1%
ln($HWOUTS_{DB03}$)		0%				1%		1%		-1%
ln(PEN_{DB111})			1%		0%		0%		1%	
ln($LWPEN_{DB111}$)				21%		21%		21%		22%
ln($HWPEN_{DB111}$)				-1%		-1%		-1%		-1%
ln($TECH_{DB53}$)	3%	4%	3%	0%	3%	1%	3%	1%	3%	1%
	------------------- **Wage Share, Academic Education** -------------------									
Relative wage$_{mun}$, Vocational skills	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Relative wage$_{mun}$, Long education	-4%	-4%	-4%	-4%	-4%	-4%	-4%	-4%	-4%	-4%
ln($Y_{i,}$)	-39%	-40%	-40%	-43%	-39%	-43%	-39%	-43%	-40%	-44%
ln($K_{i,}$)	26%	25%	25%	24%	26%	23%	26%	24%	25%	23%
ln($OUTS_{DB03}$)	-1%				-1%		-1%		4%	
ln($LWOUTS_{DB03}$)		6%				3%		3%		2%
ln($HWOUTS_{DB03}$)		-2%				-1%		-2%		1%
ln(PEN_{DB111})			1%		1%		1%		1%	
ln($LWPEN_{DB111}$)				58%		56%		56%		55%
ln($HWPEN_{DB111}$)				-4%		-4%		-4%		-4%
ln($TECH_{DB53}$)	24%	24%	24%	16%	23%	16%	23%	17%	23%	17%

Table A1: Share of Firms with at Least one Employee of a Given Educational Length

	1999	2000	2001	2002
	-------------------- All Manufacturing Firms --------------------			
No Education	84.8%	83.8%	83.1%	82.5%
Vocational Education	86.2%	86.3%	86.5%	86.5%
Short Academic Education	30.6%	31.2%	31.9%	32.3%
Medium Academic Education	30.1%	30.8%	31.2%	31.4%
Long Academic Education	18.3%	18.9%	19.4%	20.2%
	----- Manufacturing Firms With 10 or More Employees -----			
No Education	99.5%	99.4%	99.3%	99.1%
All Educations	99.9%	99.9%	99.9%	99.9%
	----- Manufacturing Firms With 50 or More Employees -----			
No Education	100.0%	100.0%	100.0%	100.0%
Vocational or Short Academic Education	100.0%	100.0%	100.0%	100.0%
Medium or Long Academic Education	95.8%	96.0%	96.3%	96.6%

Table A2: Number of Firms, Aggregate Turnover and Capital Stock in Danish Manufacturing

	1999	2000	2001	2002
	------------------- All Manufacturing Firms -------------------			
Number of Firms	13,341	13,132	12,788	12,379
Turnover in Billions D.Kr.	465	518	552	550
Capital in Billions D.Kr.	434	478	488	496
	----- Manufacturing Firms with 10 or More employees -----			
Number of Firms	5,205	5,146	5,019	4,814
Turnover in Billions D.Kr.	436	488	521	521
Capital in Billions D.Kr.	414	457	468	475
	----- Manufacturing Firms with 50 or More employees -----			
Number of Firms	1,420	1,460	1,416	1,355
Turnover in Billions D.Kr.	362	413	444	444
Capital in Billions D.Kr.	363	405	416	422

Table A3: Using Intensities: Change in Skilled Wage Share as Dependent Variable, 1999-2002, Fixed Effects Estimation Two Education Groups, Outsourcing Measures $OUTS^{all}$ and $OUTS^{all}_{DB03}$

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
Relative wage$_{mun}$, skilled	-0,0495	-0,0500	-0,0483	-0,0505	-0,0506	-0,0484	-0,0500	-0,0506	-0,0475	-0,0489
	(3.45)**	(3.49)**	(3.37)**	(3.52)**	(3.53)**	(3.38)**	(3.49)**	(3.53)**	(3.31)**	(3.41)**
ln($Y_{i,}$)	-0,0024	-0,0023	-0,0024	-0,0025	-0,0024	-0,0024	-0,0025	-0,0024	-0,0025	-0,0026
	(1,23)	(1,18)	(1,23)	(1,29)	(1,23)	(1,24)	(1,27)	(1,20)	(1,28)	(1,35)
ln(K_i)	-0,0012	-0,0012	-0,0012	-0,0010	-0,0011	-0,0012	-0,0012	-0,0012	-0,0013	-0,0011
	(0,74)	(0,72)	(0,76)	(0,64)	(0,71)	(0,75)	(0,74)	(0,71)	(0,79)	(0,67)
$OUTS_{DB03}$/ Y_{DB03}	0,0119						0,0164			
	(1,24)						(1,69)			
OUTS/ Y		0,0002						0,0003		
		(0,06)						(0,09)		
$LWOUTS_{DB03}$/ Y_{DB03}			0,0887						0,0758	
			(3.20)**						(2.58)**	
$HWOUTS_{DB03}$/ Y_{DB03}			-0,0037						0,0000	
			(0,34)						0,00	
LWOUTS/ Y				0,0140						0,0134
				(2.39)*						(2.30)*
HWOUTS/ Y				-0,0092						-0,0094
				(1,93)						(1.97)*
PEN_{DB111}/ Y_{DB111}					-0,0780		-0,0891	-0,0780		
					(2.23)*		(2.50)*	(2.23)*		
$LWPEN_{DB111}$/ Y_{DB111}						0,5231			0,3803	0,5142
						(3.24)**			(2.23)*	(3.19)**
$HWPEN_{DB111}$/ Y_{DB111}						-0,2164			-0,2048	-0,2155
						(4.30)**			(4.02)**	(4.28)**
$TECH_{DB53}$/ Y_{DB53}	0,2835	0,2884	0,2775	0,2867	0,2863	0,2723	0,2791	0,2861	0,2641	0,2708
	(5.07)**	(5.17)**	(4.96)**	(5.14)**	(5.13)**	(4.87)**	(4.99)**	(5.13)**	(4.72)**	(4.85)**
Observations	20184	20184	20184	20184	20184	20184	20184	20184	20184	20184
Number of Firms	6612	6612	6612	6612	6612	6612	6612	6612	6612	6612

Note: * significant at 5 % level; ** significant at 1 % level

Table A4: Using Intensities: Change in Skilled Wage Share as Dependent Variable, 1999-2002, Fixed Effects Estimation Two Education Groups, Outsourcing Measures $OUTS^{broad}_{DB03,DB111}$ and $OUTS^{narrow}_{DB03,DB111}$

	$\Omega = OUTS^{broad}_{DB03,DB111}$	$\Omega = OUTS^{broad}_{DB03,DB111}$	$\Omega = OUTS^{narrow}_{DB03,DB111}$	$\Omega = OUTS^{narrow}_{DB03,DB111}$
	(11)	(12)	(13)	(14)
Relative wage$_{mun}$, skilled	-0,0502	-0,0474	-0,0505	-0,0472
	(3.50)**	(3.31)**	(3.53)**	(3.29)**
ln($Y_{i,}$)	-0,0025	-0,0025	-0,0024	-0,0025
	(1,27)	(1,28)	(1,25)	(1,30)
ln(K_i)	-0,0012	-0,0013	-0,0012	-0,0012
	(0,73)	(0,79)	(0,71)	(0,77)
Ω/ Y_{DB03}	0,0162		0,0084	
	(1,60)		(0,77)	
LWΩ/ Y_{DB03}		0,0978		0,0920
		(3.07)**		(2.92)**
HWΩ/ Y_{DB03}		-0,0014		-0,0052
		(0,13)		(0,42)
PEN_{DB111}/ Y_{DB111}	-0,0889		-0,0792	
	(2.49)*		(2.26)*	
$LWPEN_{DB111}$/ Y_{DB111}		0,3515		0,4883
		(2.06)*		(3.01)**
$HWPEN_{DB111}$/ Y_{DB111}		-0,2035		-0,2093
		(4.00)**		(4.13)**
$TECH_{DB53}$/ Y_{DB53}	0,2798	0,2649	0,2843	0,2646
	(5.00)**	(4.73)**	(5.09)**	(4.73)**
Observations	20184	20184	20184	20184
Number of Firms	6612	6612	6612	6612

Note: * significant at 5 % level; ** significant at 1 % level

Table A5: Using Intensities: Change in Skilled and Educated Wage Share as Dependent Variable, 1999-2002, Fixed Effects Estimation, Three Education Groups, Outsourcing Measure $OUTS_{DB03}^{all}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	------------------ Wage Share, Vocational Education ------------------									
Relative wage$_{mun}$, Vocational skills	-0,0171	-0,0173	-0,0150	-0,0174	-0,0174	-0,0144	-0,0172	-0,0173	-0,0138	-0,0144
	(1,22)	(1,23)	(1,07)	(1,24)	(1,24)	(1,02)	(1,22)	(1,23)	(0,98)	(1,02)
Relative wage$_{mun}$, Long education	-0,0268	-0,0268	-0,0265	-0,0266	-0,0271	-0,0265	-0,0270	-0,0269	-0,0263	-0,0264
	(4.45)**	(4.45)**	(4.40)**	(4.41)**	(4.49)**	(4.39)**	(4.47)**	(4.46)**	(4.35)**	(4.36)**
ln($Y_{i,}$)	0,0043	0,0045	0,0043	0,0045	0,0044	0,0044	0,0043	0,0045	0,0043	0,0044
	(2.09)*	(2.16)*	(2.10)*	(2.16)*	(2.11)*	(2.11)*	(2.09)*	(2.16)*	(2.09)*	(2.12)*
ln(K_i)	-0,0014	-0,0015	-0,0016	-0,0015	-0,0014	-0,0016	-0,0015	-0,0015	-0,0017	-0,0016
	(0,72)	(0,73)	(0,78)	(0,73)	(0,69)	(0,79)	(0,73)	(0,73)	(0,83)	(0,80)
$OUTS_{DB03}$/ Y_{DB03}	0,0075						0,0080			
	(0,87)						(0,91)			
OUTS/ Y		0,0030						0,0030		
		(0,60)						(0,60)		
$LWOUTS_{DB03}$/ Y_{DB03}			0,0949						0,0837	
			(3.90)**						(3.23)**	
$HWOUTS_{DB03}$/ Y_{DB03}			-0,0101						-0,0084	
			(1,03)						(0,86)	
LWOUTS/ Y				0,0042						-0,0032
				(0,30)						(0,22)
HWOUTS/ Y				0,0027						0,0024
				(0,51)						(0,45)
PEN_{DB111}/ Y_{DB111}					-0,0030		-0,0096	-0,0038		
					(0,09)		(0,28)	(0,11)		
$LWPEN_{DB111}$/ Y_{DB111}						0,4744			0,2754	0,4794
						(2.73)**			(1,49)	(2.71)**
$HWPEN_{DB111}$/ Y_{DB111}						-0,0828			-0,0667	-0,0831
						(1,88)			(1,49)	(1,88)
$TECH_{DB53}$/ Y_{DB53}	0,1423	0,1432	0,1372	0,1431	0,1443	0,1367	0,1414	0,1429	0,1319	0,1362
	(2.76)**	(2.78)**	(2.67)**	(2.78)**	(2.80)**	(2.65)**	(2.74)**	(2.77)**	(2.56)*	(2.64)**

Table A5: Using Intensities: Change in Skilled and Educated Wage Share as Dependent Variable, 1999-2002, - **(continued)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	------------------- Wage Share, Academic Education -------------------									
Relative wage$_{mun}$, Vocational skills	-0,0268	-0,0268	-0,0265	-0,0266	-0,0271	-0,0265	-0,0270	-0,0269	-0,0263	-0,0264
	(4.45)**	(4.45)**	(4.40)**	(4.41)**	(4.49)**	(4.39)**	(4.47)**	(4.46)**	(4.35)**	(4.36)**
Relative wage$_{mun}$, Long education	0,0301	0,0301	0,0303	0,0300	0,0299	0,0301	0,0300	0,0301	0,0302	0,0300
	(5.61)**	(5.63)**	(5.65)**	(5.60)**	(5.58)**	(5.62)**	(5.59)**	(5.61)**	(5.64)**	(5.61)**
ln($Y_{i,}$)	-0,0172	-0,0168	-0,0172	-0,0167	-0,0171	-0,0171	-0,0172	-0,0168	-0,0172	-0,0168
	(10.23)**	(9.96)**	(10.25)**	(9.91)**	(10.19)**	(10.22)**	(10.24)**	(9.97)**	(10.27)**	(9.97)**
ln(K_i)	0,0103	0,0102	0,0103	0,0100	0,0104	0,0102	0,0103	0,0102	0,0101	0,0099
	(6.37)**	(6.28)**	(6.33)**	(6.18)**	(6.43)**	(6.32)**	(6.36)**	(6.28)**	(6.26)**	(6.12)**
$OUTS_{DB03}$/ Y_{DB03}	0,0123						0,0134			
	(1,77)						(1,88)			
OUTS/ Y		0,0086						0,0087		
		(2.17)*						(2.18)*		
$LWOUTS_{DB03}$/ Y_{DB03}			0,0615						0,0492	
			(3.13)**						(2.35)*	
$HWOUTS_{DB03}$/ Y_{DB03}			0,0024						0,0044	
			(0,31)						(0,55)	
LWOUTS/ Y				0,0427						0,0380
				(3.77)**						(3.28)**
HWOUTS/ Y				0,0028						0,0026
				(0,64)						(0,59)
PEN_{DB111}/ Y_{DB111}					-0,0083		-0,0195	-0,0108		
					(0,31)		(0,70)	(0,40)		
$LWPEN_{DB111}$/ Y_{DB111}						0,4247			0,3035	0,3263
						(3.04)**			(2.04)*	(2.29)*
$HWPEN_{DB111}$/ Y_{DB111}						-0,0813			-0,0776	-0,0742
						(2.28)*			(2.15)*	(2.08)*
$TECH_{DB53}$/ Y_{DB53}	0,2385	0,2384	0,2355	0,2361	0,2417	0,2342	0,2367	0,2376	0,2290	0,2296
	(5.73)**	(5.74)**	(5.66)**	(5.68)**	(5.81)**	(5.63)**	(5.68)**	(5.71)**	(5.49)**	(5.52)**
Observations	5651	5651	5651	5651	5651	5651	5651	5651	5651	5651

Note: * significant at 5 % level; ** significant at 1 % level

Table A6: Using Intensities: Change in Skilled and Educated Wage Share as Dependent Variable, 1999-2002, Fixed Effects Estimation, Three Education Groups, Outsourcing Measures $OUTS^{broad}_{DB03,DB111}$ and $OUTS^{narrow}_{DB03,DB111}$

	$\Omega = OUTS^{broad}_{DB03,DB111}$	$\Omega = OUTS^{broad}_{DB03,DB111}$	$\Omega = OUTS^{narrow}_{DB03,DB111}$	$\Omega = OUTS^{narrow}_{DB03,DB111}$
	------------------ **Wage Share, Vocational Education** -------------------			
Relative wage$_{mun}$, Vocational skills	-0,0172	-0,0137	-0,0174	-0,0142
	(1,23)	(0,97)	(1,24)	(1,01)
Relative wage$_{mun}$, Long education	-0,0271	-0,0263	-0,0271	-0,0263
	(4.48)**	(4.36)**	(4.49)**	(4.36)**
ln($Y_{i,}$)	0,0043	0,0043	0,0044	0,0044
	(2.09)*	(2.08)*	(2.12)*	(2.10)*
ln(K_i)	-0,0014	-0,0017	-0,0014	-0,0016
	(0,72)	(0,84)	(0,69)	(0,80)
Ω/ Y_{DB03}	0,0067		-0,0021	
	-0,7300		-0,2100	
LWΩ/ Y_{DB03}		0,0988		0,0412
		(3.39)**		-1,3500
HWΩ/ Y_{DB03}		-0,0108		-0,0099
		-1,0600		-0,9300
PEN_{DB111}/ Y_{DB111}	-0,0081		-0,0021	
	(0,24)		(0,06)	
$LWPEN_{DB111}$/ Y_{DB111}		0,2455		0,4057
		(1,32)		(2.25)*
$HWPEN_{DB111}$/ Y_{DB111}		-0,0646		-0,0733
		(1,45)		(1,65)
$TECH_{DB53}$/ Y_{DB53}	0,1420	0,1314	0,1446	0,1346
	(2.75)**	(2.55)*	(2.81)**	(2.61)**
	------------------ **Wage Share, Vocational Education** -------------------			
Relative wage$_{mun}$, Vocational skills	-0,0271	-0,0263	-0,0271	-0,0263
	(4.48)**	(4.36)**	(4.49)**	(4.36)**
Relative wage$_{mun}$, Long education	0,0299	0,0302	0,0299	0,0302
	(5.59)**	(5.63)**	(5.58)**	(5.65)**
ln($Y_{i,}$)	-0,0171	-0,0172	-0,0171	-0,0172
	(10.22)**	(10.25)**	(10.20)**	(10.27)**
ln(K_i)	0,0104	0,0102	0,0104	0,0102
	(6.39)**	(6.28)**	(6.43)**	(6.30)**
Ω/ Y_{DB03}	0,0082		0,0041	
	(1,10)		(0,52)	
LWΩ/ Y_{DB03}		0,0404		0,0713
		(1,72)		(2.89)**
HWΩ/ Y_{DB03}		0,0003		-0,0074
		(0,03)		(0,86)
PEN_{DB111}/ Y_{DB111}	-0,0147		-0,0101	
	(0,53)		(0,37)	
$LWPEN_{DB111}$/ Y_{DB111}		0,3289		0,3105
		(2.19)*		(2.14)*
$HWPEN_{DB111}$/ Y_{DB111}		-0,0765		-0,0692
		(2.12)*		-1,9300
$TECH_{DB53}$/ Y_{DB53}	0,2389	0,2310	0,2411	0,2301
	(5.73)**	(5.54)**	(5.80)**	(5.53)**
Observations	5651	5651	5651	5651

Note: * significant at 5 % level; ** significant at 1 % level